Frederick County Greenhouse Gas Emissions Inventory Report

Community and Government Operations
BASELINE DATA YEAR: 2007

Prepared for the Board of County Commissioners

August 2010

Overview of Presentation

- Project Background & Overview
- Inventory Results - 2007 Baseline
  - Community Emissions
  - Government Operations Emissions
- Recommended Inventory Improvements
- Next Steps

GHG Emission Inventories

Greenhouse Gas Emission Inventory

What it is and what it isn't

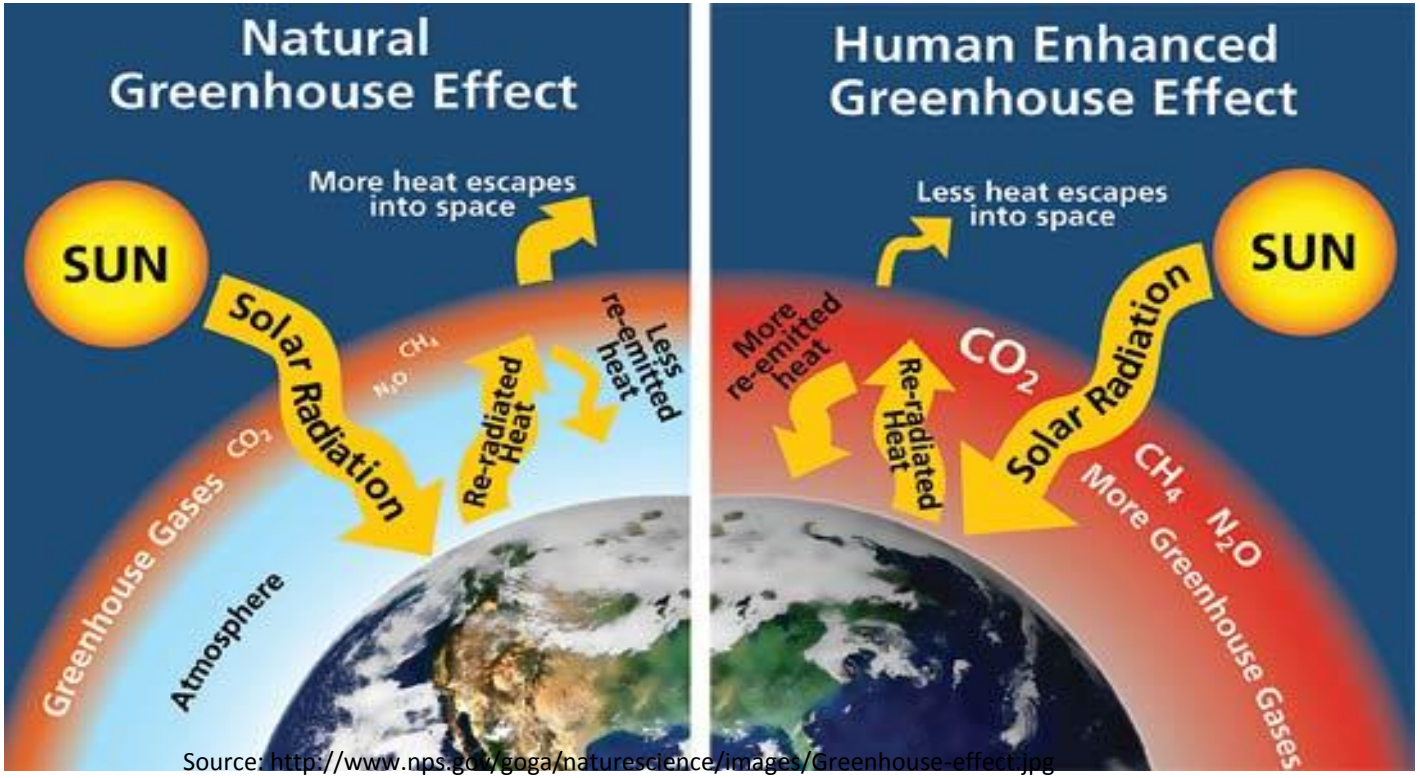
What does a metric ton of Carbon Dioxide look like?

http://energyrenewable.files.wordpress.com/2009/12/one-tonne-co2.jpg

Climate Change Background

"Climate change is occurring, is caused largely by human activities, and poses significant risk for – and in many cases is already affecting – a broad range of human and natural systems."

Intergovernmental Panel on Climate Change



Source: http://www.nps.gov/goga/naturescience/images/Greenhouse-effect.jpg

Climate Change

Global Effects of Climate Change

- Extreme Weather Events
- Loss of Sea Ice
- Rising Sea Levels
- Climate-Related Natural Disasters

Local Impacts

- Challenges of Extreme Weather Events
- MWCOG Risk Level Ranking for Severe Weather Events

Potential Risk Level for Frederick County

- **High** – Drought, Flash/River Flooding, Thunderstorm, Tornado
- **Medium** – Extreme Heat, Winter Weather (Snow and Ice)
- Part of *Frederick County Hazard Mitigation Plan* adopted by the Board of County Commissioners in June of 2010

Regional Context

Maryland Greenhouse Gas Reduction Act of 2009

- Reduce Baseline Emissions Levels 25% by 2020
- Prepare plan to meet longer-term goal of 90% reduction by 2050

Metropolitan Washington Council of Governments

National Capital Region Climate Change Report (November 2008)

Estimates Business-As-Usual GHG Emissions will:

35-38% by 2030
43-47% by 2050

Sets Goals for Emissions Reductions of:

10% below BAU levels by 2012
20% below 2005 levels by 2020
80% below 2005 levels by 2050

Reasoning, Methodology & Model

Accounting & Reporting Principles

- Local Government Operations Protocol & CACP Software – ICLEI
  - National Standard for Local Government
  - Community Protocol in Development for 2011 Release

Inventory Boundaries

- Geopolitical Boundaries for Frederick County
- Frederick County Government – Operational Control
  - Buildings and other facilities – *Management Services*;
  - Water delivery, water treatment and solid waste facilities – *Utilities and Solid Waste Management;*
  - Streetlights and traffic signals – *Management Services*;
  - Vehicle fleet – *Management Services*;
  - Transit fleet – *Transit Services*; and
  - Landfill & Wastewater treatment process emissions – *Utilities and Solid Waste Management*

Reasoning, Methodology & Model

Baseline Year Selection – 2007

- Consistent with County's CEP - facilitated data collection
- Coincides with commencement of current BOCC Term
- Prior to implementing significant energy reduction strategies
- Reflective of Baseline Year of Other Regional Inventories

Classification of Emissions

Direct

Scope 1

Stationary & Mobile Combustion

Fugitive Process Emissions

Indirect

Scope 2

Purchased Electricity

Scope 3

Optional Sources

Reported Greenhouse Gases

Six Greenhouse Gases Regulated under Kyoto Protocol of 1997

Greenhouse Gas	GWP	Sources
Carbon Dioxide (CO_2)	1	Fossil fuel combustion, forest clearing, cement production, etc.
Methane (CH_4)	21	Landfills, production and distribution of natural gas & petroleum, fermentation from the digestive system of livestock, rice cultivation, fossil fuel combustion, etc.
Nitrous Oxide (N_2O)	310	Fossil fuel combustion, fertilizers, nylon production, manure, etc.
Hydrofluorocarbons (HFCs)	140-11,700	Refrigeration gases, aluminum smelting, semiconductor manufacturing, etc.
Perfluorocarbons (PFCs)	6,500 – 9,200	Aluminum production, semiconductor industry, etc.
Sulfur Hexafluoride (SF_6)	23,900	Electrical transmissions and distribution systems, circuit breakers, magnesium production, etc.

Source: IPCC,2nd Assessment Report

Calculating Greenhouse Gas Emissions

Basic Calculation

Activity Data
(e.g. gallons of fuel)

×

Emission Factor
kg of GHG/unit

=

Emissions

Converting to Carbon Dioxide Equivalent

Emissions
kg of GHG

×

GWP
of GHG

÷

1,000
(kg/metric ton)

=

Emissions in metric tons of CO_2e

Emissions Inventory Results

Community Emissions – 2007 Baseline

Organized by Three Major Emission Sources:

1. Energy Consumption
   - Fossil Fuel Combustion & Purchased Electricity
   - Residential & Non-Residential

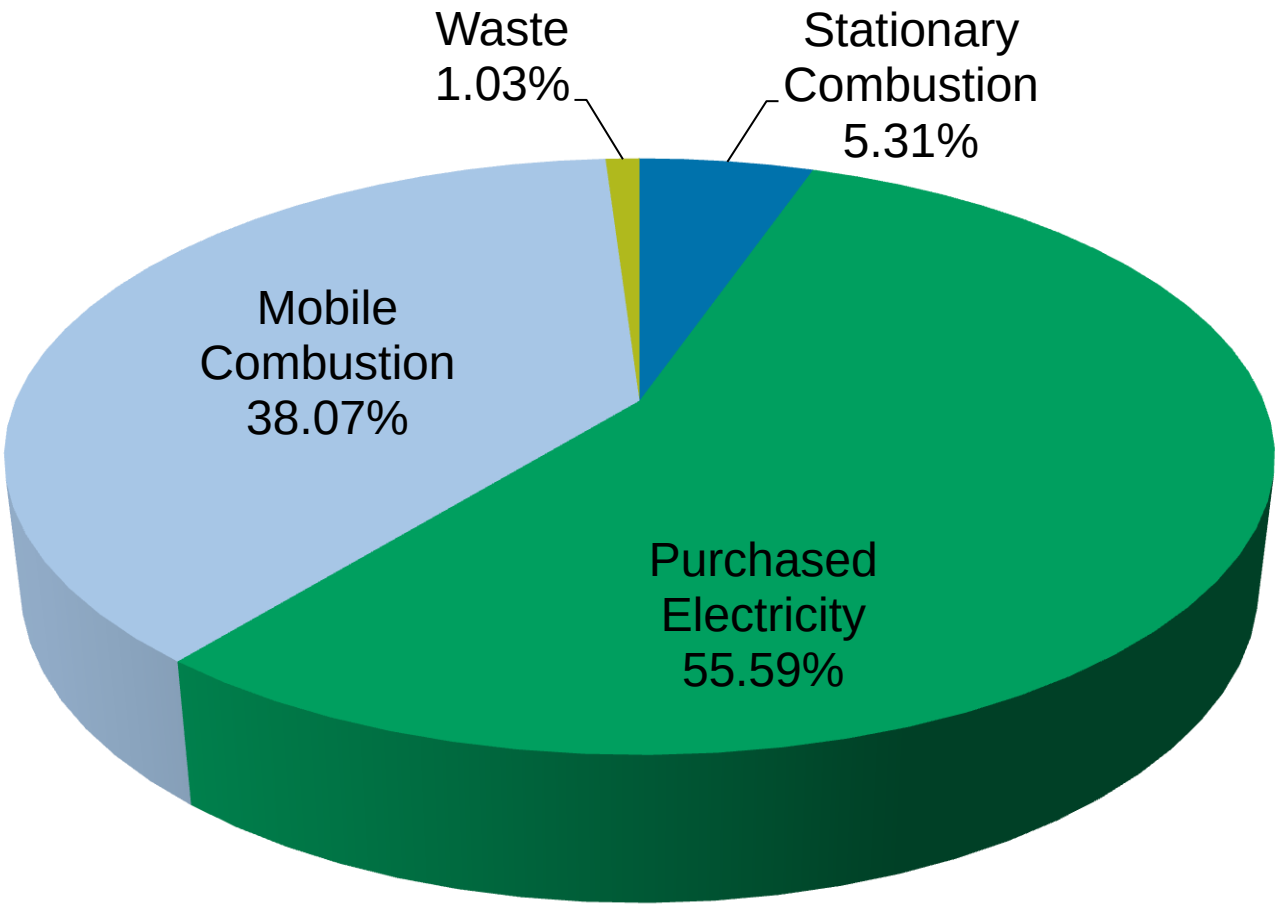
2. Mobile Combustion – Transportation
   - Vehicle Miles Traveled Through & Within County
   - Disaggregated by Vehicle Type & Fuels Used

3. Waste Disposal
   - Disposal Method & Composition

Community Emissions

2007 Community Emissions by Source

6,388,262 Metric Tons of CO_2e



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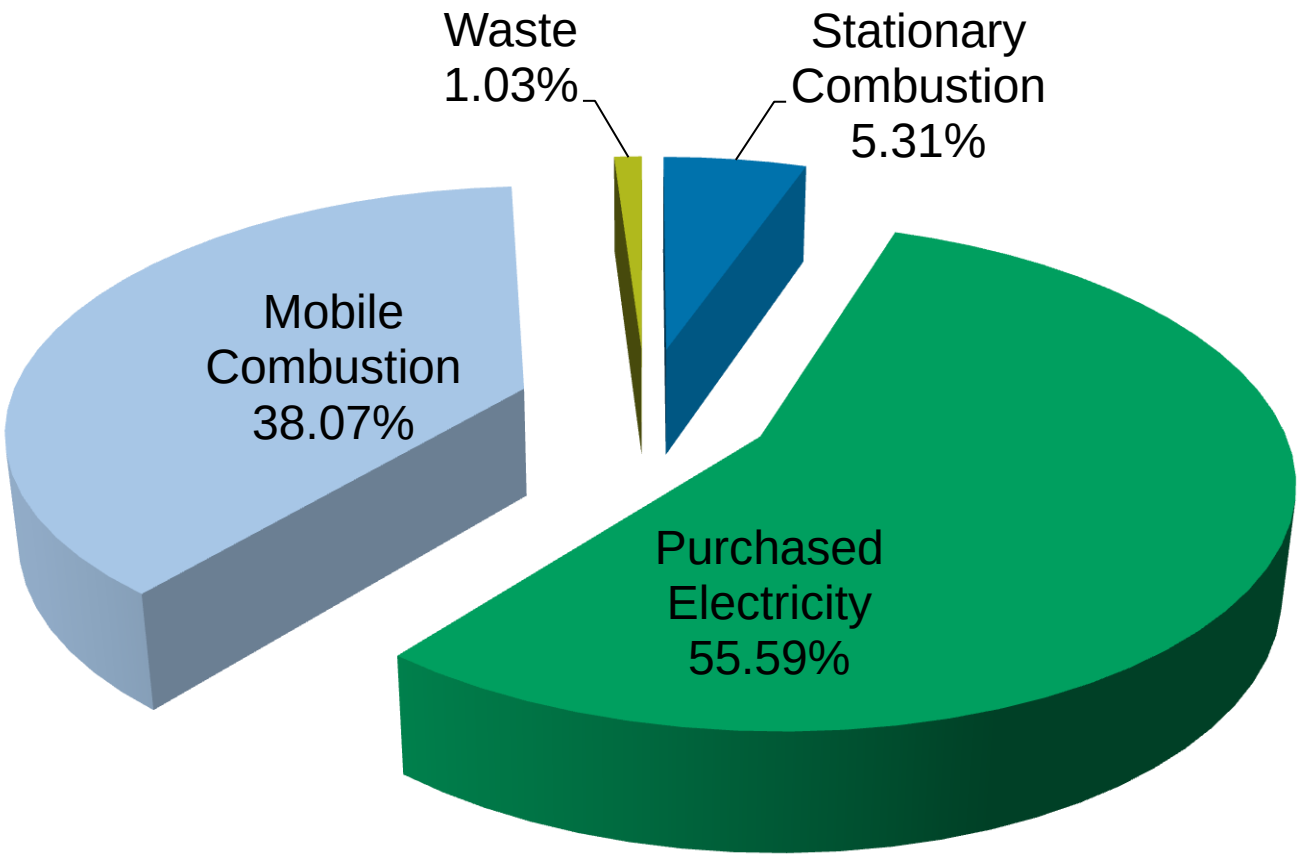


Community Emissions

2007 Energy Consumption

Stationary Combustion

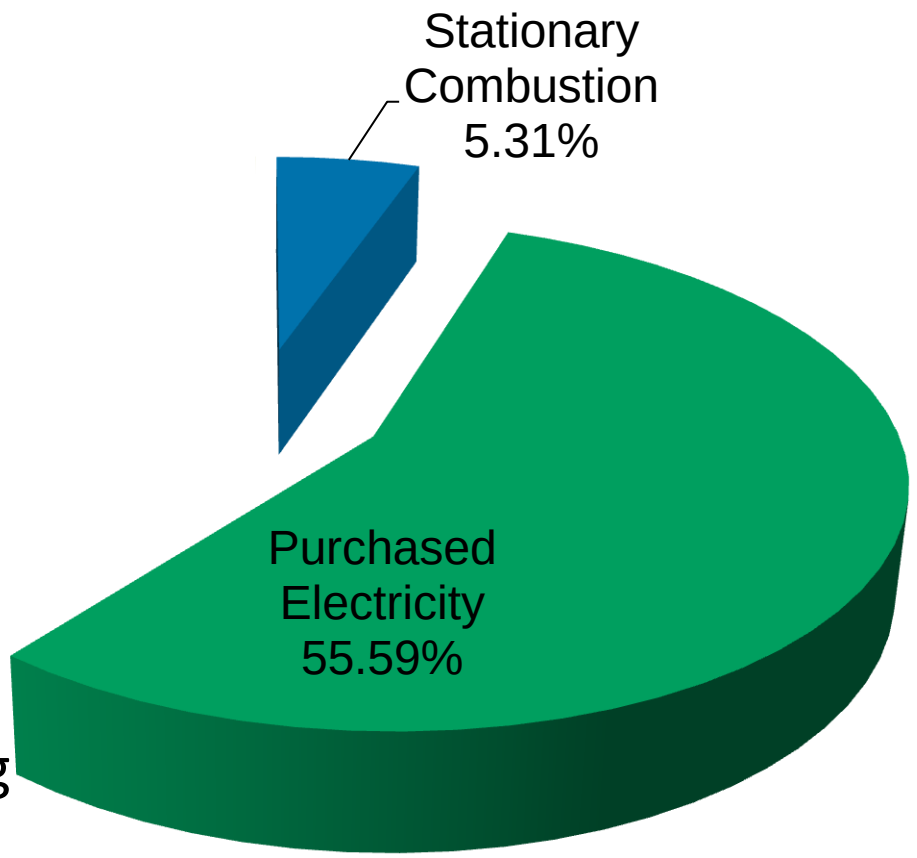
339,042 mt CO_2e

- Natural Gas
- Fuel Oil/Kerosene
- Propane

Purchased Electricity

3,551,526 mt CO_2e

- 75% is Non-Residential
- Proxy Year 2005 Data
- Eastalco Manufacturing

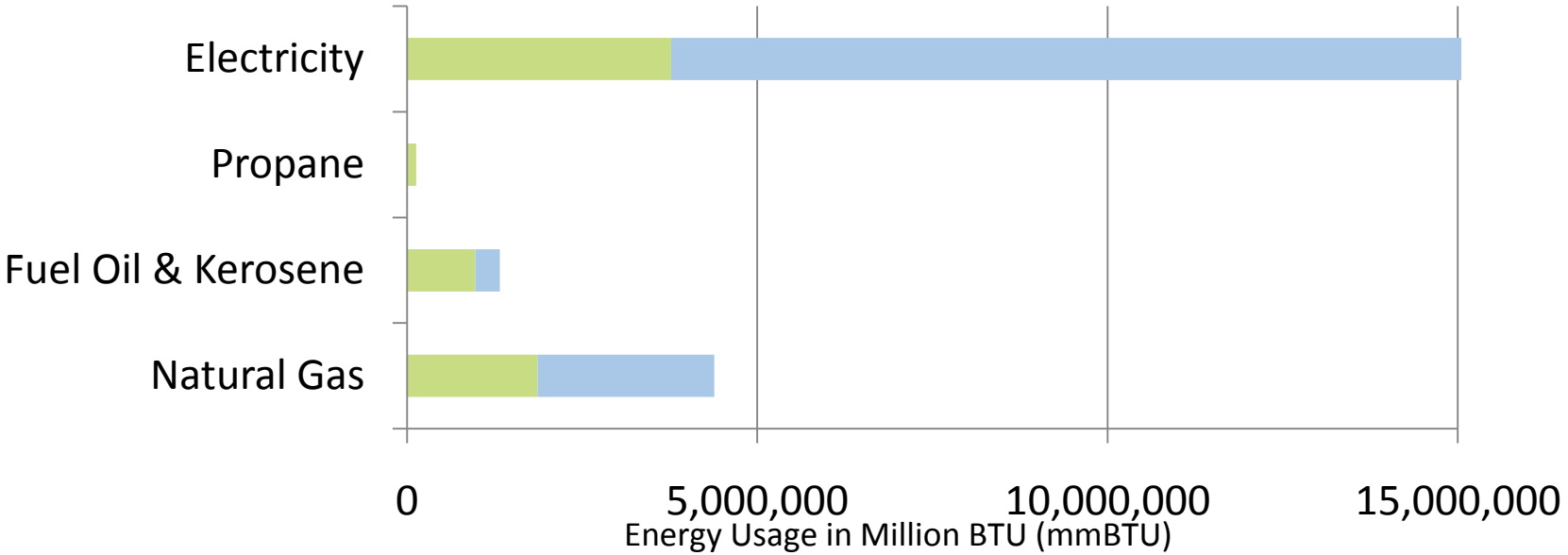


Community Emissions

2007 Energy Consumption

Residential
6,737,443 mmBTU
953,815 mt CO_2e

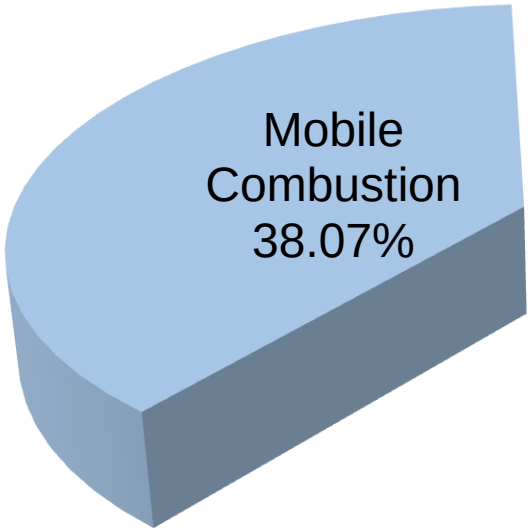
Non-Residential
16,386,860 mmBTU
2,936,752 mt CO_2e



Community Emissions

2007 Transportation - Mobile Combustion

2,431,798 mt CO_2e



Contributing factor-

County is intersected by 5 major highways; within hour of 2 metro areas

Emissions Estimation Based On:

- Vehicle Miles Traveled - MWCOG Reports
- Vehicle Classes – EPA Mobile 6.2
- Average Fuel Efficiencies
- Calculate Estimation of Fuel Consumption

Community Emissions

2007 Waste

65,896 mt CO_2e

232,587.32 tons

Exported 90% to 5 sites MD,PA,VA

Estimations Based on:

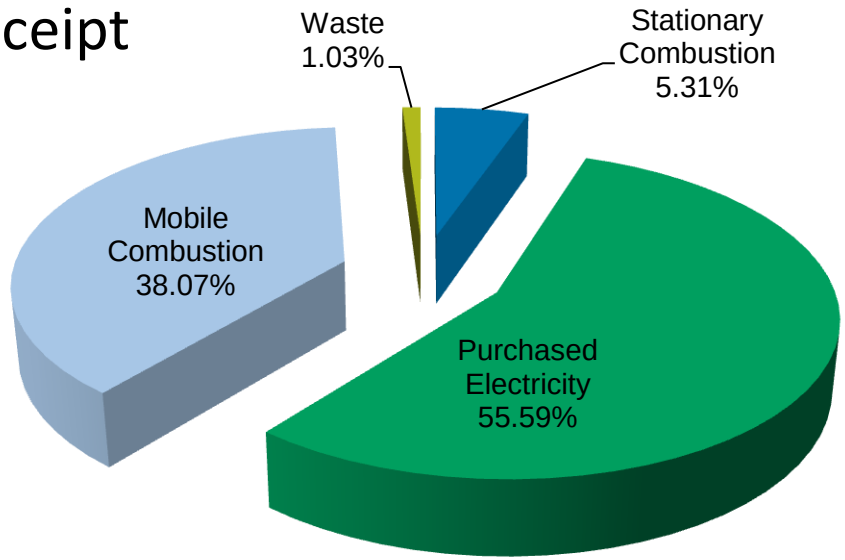
- Managed Landfill

Waste Composition Model	
Paper	40%
Organic (food)	29%
Yard Waste	1%
Wood	6%
Other (plastic, metals, glass, inorganic)	24%

Community Emissions

Summary of 2007 Emissions

- 6,388,262 Metric Tons of CO_2e
- Per Capita Emissions of 27.5 $mtCO_2e$
  National average per capita of 19-20 metric tons
- Amend 2007 Baseline after receipt of 2007 Allegheny data



Operations Emissions - Baseline 2007

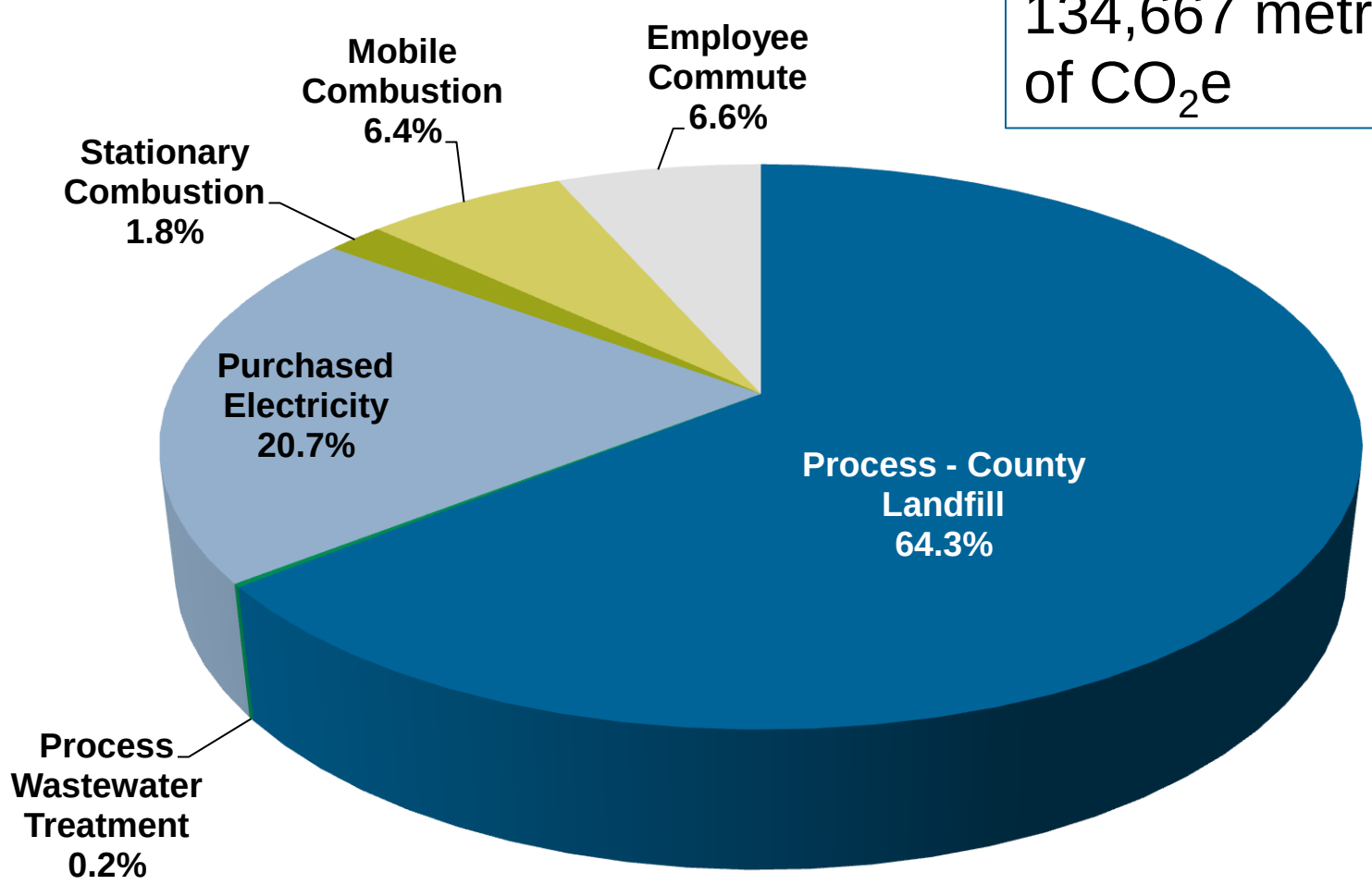
Organized by Four Major Emission Sources:

1. Energy Consumption – Buildings & Facilities
   - Fossil Fuel Combustion & Purchased Electricity
2. Mobile Combustion – Transportation
   - Fleet & Transit Fuel Consumption
3. Wastewater Treatment & Landfill Fugitive Emissions
4. Employee Commute

Government Operations Emissions

2007 Emissions by Source

134,667 metric tons of CO_2e



Government Operations Emissions

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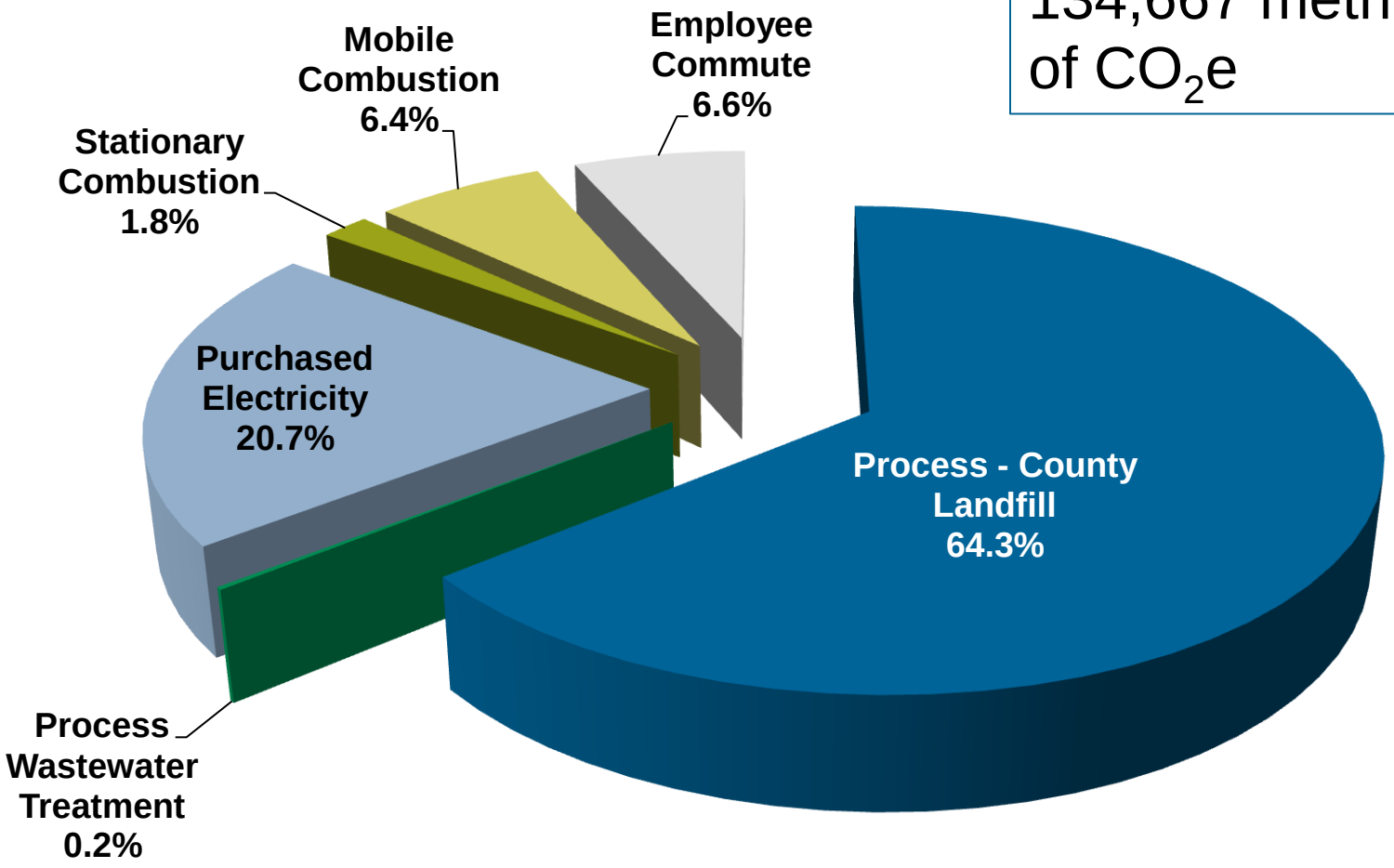
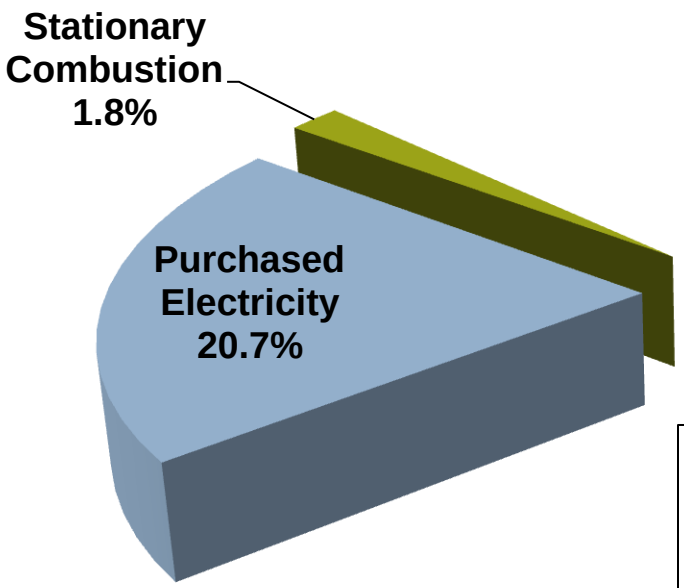


Government Operations Emissions

Energy Consumption - Buildings & Facilities



Stationary Combustion

2,453 mt CO_2e

- Natural Gas
- Fuel Oil/Kerosene

Purchased Electricity

27,846 mt CO_2e

- FCG Buildings & Facilities
- Streetlight & Traffic Signal Sites
- Water Delivery Facilities
- Wastewater Treatment Facilities
- Solid Waste Facilities

Government Operations Emissions

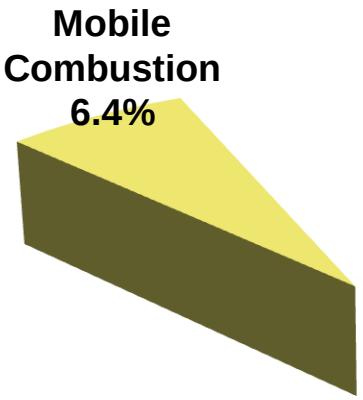
Energy Consumption by Category

Category	Natural Gas (therms)	Fuel Oil (gal)	Electricity (MWh)	Total Converted to mmBtu	Emissions (mt CO_2e)
Buildings & Facilities	417,409	3,747.54	22,291.66	118,342	17,893
Streetlights & Traffic Signal Sites	--	--	490.75	1,675	344
Water Delivery Facilities	49	--	6,000.08	20,483	4,208
Wastewater Facilities	36,582	--	9,708.39	36,793	7,004
Solid Waste Facilities	-	--	1,211.58	4,135	850
Total	**454,040**	**3,747.54**	**39,702.46**	**181,428**	**30,299**

Government Operations Emissions

2007 Mobile Combustion

8,737 metric tons CO_2e



Sector and Fuel Type	Fuel Consumed (gal)	Emissions ($mtCO_2e$)	Percent of Total
Fleet			
Gasoline	424,955	3,774	43.2%
Diesel	267,642	2,718	31.1%
Transit			
Gasoline	9,834	87	1.0%
Diesel	212,552	2,158	24.7%

Government Operations Emissions

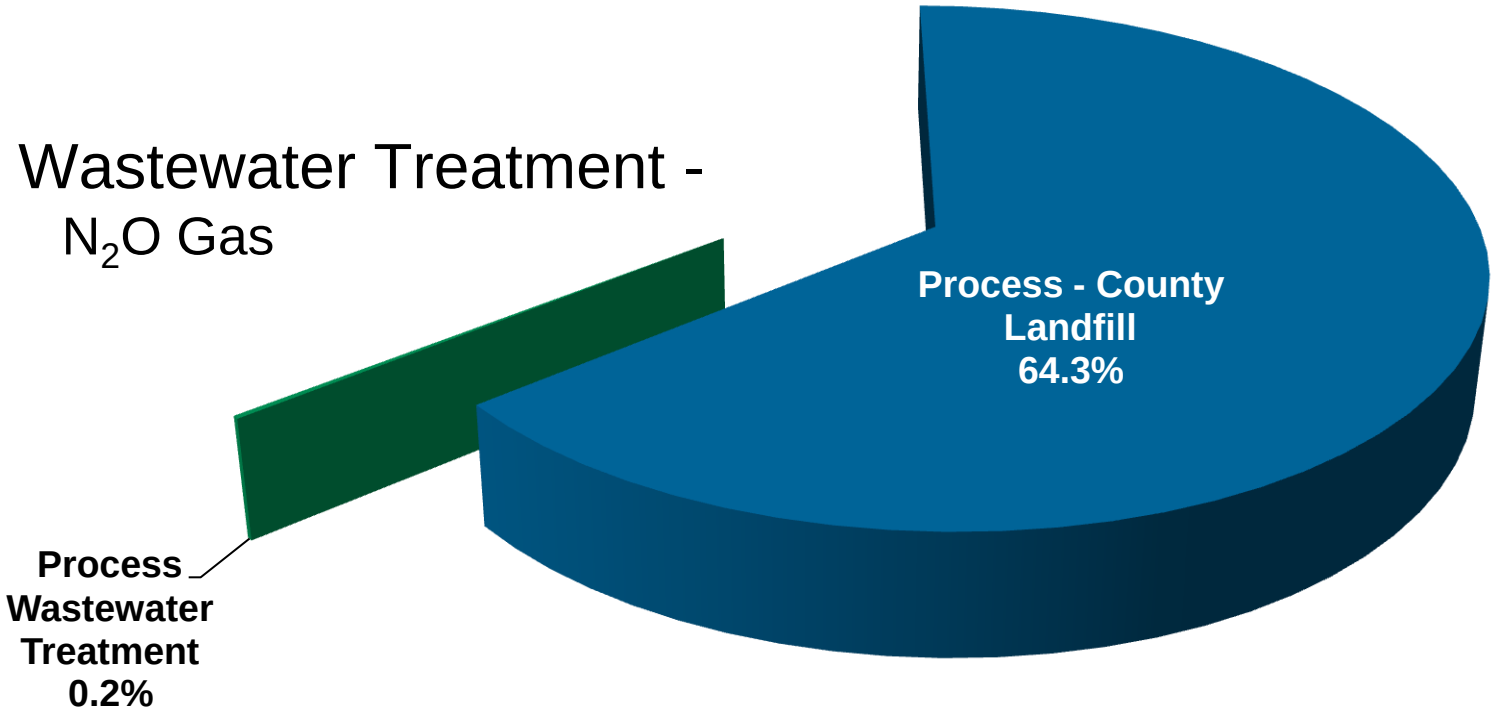
2007 Fugitive Process Emissions

Does not include possible greenhouse gas emissions and offsets associated with the County's natural wood waste composting operation.

8,861 metric tons of CO_2e

Landfill - Methane and CO_2 Gas

Wastewater Treatment - N_2O Gas



Government Operations Emissions

2007 Employee Commute

8,861 metric tons of CO_2e

Frederick County Employee Commute Survey

OES - Spring 2010

- 800 Respondents
- 25% Response Rate
- Full time, Part time, & Temporary/Seasonal
- Commuting Habits

Employee Commute 6.6%

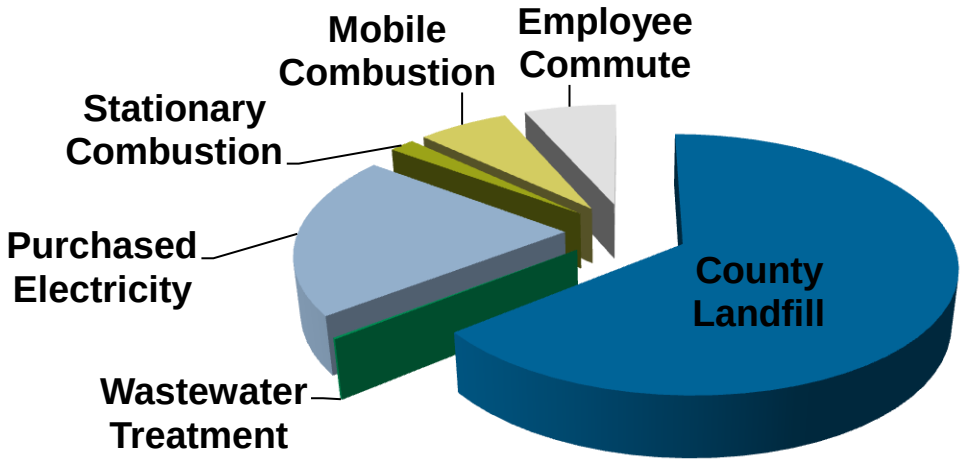
Data Collected

- Commute Length - Time & Miles
- Fuel Type
- Fuel Efficiency
- # of Days Commute
- Mode by Day
- Commute Choices

Government Operations Emissions

Summary of 2007 Emissions

- **134,667** Metric Tons of CO_2e
- **2.1%** of Total Frederick County Community Emissions
  MWCOG Estimates Regional Average is 3-4%
- FCG 2007-2010 – Significant Steps in Energy Reductions
  - Landfill Gas to Energy Project
  - Fuel Conservation Plan
  - Energy Conservation
- **Energy Reductions = Emissions Reductions**



Recommended Inventory Improvements

Annual Review Process

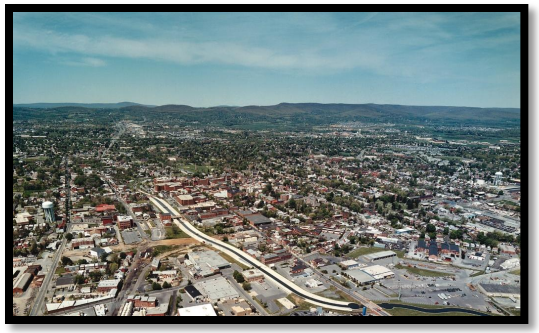
Refine Community Inventory Component

Additional Data Improvements:

- Direct emissions from industrial processes
- Accounting of waste stream composition
- Inclusion of emissions from contract services, such as waste hauling and equipment delivery
- Accounting of waste generation by building

Next Steps

Potential GHG Reduction Strategies



- Sustainable Action Plan for County Operations
- Presented to Board August 26, 2010
- Recommends FCG Commitment Target:
  Reduce County Operations Emissions 25% by 2025

Questions?